

## CLAIMS

[1]

A 6-axis sensor for measuring 6-axis forces and moments or 6-axis accelerations and angular accelerations, externally applied, characterized by comprising:

a plurality of strain gauges disposed on one plane.

[2]

The 6-axis sensor according to claim 1, characterized by further comprising a first diaphragm to which the plurality of strain gauges are attached.

[3]

The 6-axis sensor according to claim 2, characterized in that first diaphragms are arranged around a central point of the plane at regular angular intervals and at the same distance from the central point.

[4]

The 6-axis sensor according to claim 3, characterized in that the angular interval is 90 degrees.

[5]

The 6-axis sensor according to claim 4, characterized in that the diaphragms are disposed in positive and negative directions on X and Y axes with an origin being defined at the central point.

[6]

The 6-axis sensor according to claim 3,  
characterized in that the angular interval is 120 degrees.

[7]

The 6-axis sensor according to any of claims 2 to 6,  
characterized in that a thin portion of each first  
diaphragm is annular and provided with eight strain  
gauges, and

the strain gauges are disposed at outer and inner  
edge portions of the first diaphragm on a line extending  
between a central point of the first diaphragm and the  
central point of the plane, and at outer and inner edge  
portions of the first diaphragm on a line perpendicular  
to the former line at the central point of the first  
diaphragm.

[8]

The 6-axis sensor according to any of claims 2 to 7,  
characterized in that the 6-axis sensor further comprises  
an operative body provided on a central portion of the  
first diaphragm, and

6-axis accelerations and angular accelerations  
applied to the 6-axis sensor are measured.

[9]

The 6-axis sensor according to any of claims 2 to 7,  
characterized in that the 6-axis sensor further

comprises:

a first member comprising the first diaphragm;

a second member comprising a second diaphragm  
opposed to the first diaphragm and provided with no  
strain gauges; and

a connecting shaft connecting the opposed first and  
second diaphragms, and

6-axis forces and moments applied between the first  
and second members are measured.

[10]

The 6-axis sensor according to any of claims 2 to 7,  
characterized in that the 6-axis sensor further  
comprises:

a first member comprising the first diaphragm;

a second member comprising a second diaphragm  
opposed to the first diaphragm and provided with a  
plurality of strain gauges disposed on one plane, and

a connecting shaft connecting the opposed first and  
second diaphragms; and

6-axis forces and moments applied between the first  
and second members are measured.

[11]

The 6-axis sensor according to claim 10,  
characterized in that the strain gauges of the first

member and the strain gauges of the second member are disposed symmetrically with respect to a barycentric point of the 6-axis sensor.

[12]

The 6-axis sensor according to claim 11, characterized in that either outputs of the strain gauges of the first member and the strain gauges of the second member are adopted if the other outputs are out of a predetermined range.

[13]

The 6-axis sensor according to claim 2, characterized in that only one diaphragm is disposed on the plane.

[14]

The 6-axis sensor according to claim 13, characterized in that the 6-axis sensor further comprises operative bodies being in contact with the first diaphragms at positions arranged around the central point of the plane at regular angular intervals and at the same distance from the central point, and

6-axis accelerations and angular accelerations applied to the 6-axis sensor are measured.

[15]

The 6-axis sensor according to claim 13,

characterized in that the 6-axis sensor further comprises:

- a first member comprising the first diaphragm;
- a second member comprising only one second diaphragm provided with no strain gauges; and
- operative bodies connecting the first and second diaphragms,

the first and second members are disposed so that a central point of the first diaphragm of the first member is opposed to a central point of the second diaphragm of the second member, and

the operative bodies connects the first and second diaphragms at positions arranged around the central points of the first and second diaphragms at regular angular intervals and at the same distance from the central points, and 6-axis forces and moments applied between the first and second members are measured.

[16]

The 6-axis sensor according to claim 13, characterized in that the 6-axis sensor further comprises:

- a first member comprising the first diaphragm;
- a second member comprising a second diaphragm provided with a plurality of strain gauges disposed on

one plane; and

operative bodies connecting the first and second diaphragms,

the first and second members are disposed so that a central point of the first diaphragm of the first member is opposed to a central point of the second diaphragm of the second member, and

the operative bodies connects the first and second diaphragms at positions arranged around the central points of the first and second diaphragms at regular angular intervals and at the same distance from the central points, and 6-axis forces and moments applied between the first and second members are measured.

[17]

The 6-axis sensor according to claim 16, characterized in that the strain gauges of the first member and the strain gauges of the second member are disposed symmetrically with respect to a barycentric point of the 6-axis sensor.

[18]

The 6-axis sensor according to claim 17, characterized in that either outputs of the strain gauges of the first member and the strain gauges of the second member are adopted if the other outputs are out of a

predetermined range.

[19]

The 6-axis sensor according to any of claims 14 to 18, characterized in that the angular interval is 90 degrees.

[20]

The 6-axis sensor according to claim 19, characterized in that the operative bodies are disposed in positive and negative directions on X and Y axes with an origin being defined at the central point of the first diaphragm.

[21]

The 6-axis sensor according to any of claims 14 to 18, characterized in that the angular interval is 120 degrees.

[22]

The 6-axis sensor according to any of claims 14 to 21, characterized in that the strain gauges are disposed:

at edge portions of the operative bodies on a line extending between a central point of a portion on the plane corresponding to the operative bodies, and the central point of the first diaphragm;

at edge portions of the operative bodies on a line perpendicular to the former line at the central point of

the portion on the plane corresponding to the operative bodies; and

at either of edge portions of the operative bodies and edge portions of the first diaphragm, at positions arranged around the central point of the first diaphragm at regular angular intervals and at the same distance from the central point.

[23]

The 6-axis sensor according to any of claims 1 to 22, characterized in that each of the strain gauges is made of a piezoresistance element.

[24]

The 6-axis sensor according to any of claims 1 to 22, characterized in that each of the strain gauges is made of a thin film of chromium oxide formed on an insulating film.